Public Governance and the Shadow Economy

A small Introduction to empirical modeling and political economics

MARCUS RUGE

University of Potsdam, Germany[1]

February 2012

ABSTRACT How does the quality of national public governance affect the size of the shadow (informal) economy? In the context of a prolonging crisis in parts of Europe that question is becoming increasingly important. An extensive empirical Structural Equation Model is used to analyze these relations with a data set of about 60 indicators from 35 countries (mainly OECD). A revised analysis shows that the shadow economy is connected closely to its determinants. The overall development level of a country, the quality of public governance and the administrative system are the most important factors and should be the focus of politics. Index numbers for the shadow economy and public governance are presented with the best country being New Zealand. Estimates for the shadow economies as percentages of GDP can be calculated, but they depend on very specific model assumptions and definitions of the shadow economy.

KEYWORDS: Shadow economy, public governance, structural equation modeling

[1] University of Potsdam, Germany. Scientific Staff and Lecturer, Dr., E-mail: mruge@uni-potsdam.de
This paper is based on previous research, which was presented at the DIW (German Institute for Economic Research) Shadow Economy Conference at the University of Potsdam, Germany. Future research will probably expand on this topic with more critical analysis, updated data and revised concepts.

1 Introduction

What are the determinants of the shadow economy and how does it affect national economies? Economic theory often emphasizes the need for lower taxes and less regulation, but many other factors, such as administrative quality and democratic trust and values, are frequently neglected. What political implications should be drawn, in particular in times of crisis?

Modern statistics offers a range of more advanced methods to overcome some problems of limited information, which can be classified as Structural Equation Models (SEM) with latent variables. Several approaches have been introduced by, for example, Macias and Cazzavillan (2008). Critical positions can be found in Breusch (2005) and others. Important political decisions were made based on these estimations. The revised SEM in this paper model uses several indicators to approximate the quality of public governance and the extend of the shadow economy for more detailed and robust results.

2 Statistical Methods, Structural Equation Models

A short introduction into structural equation models should provide a better understanding of how the estimations work, and of their limitations. Modern econometrics offer a range of statistical methods to analyze and forecast relations in complex systems. The most common approaches are multiple regressions. More elaborate methods include vector autoregression (VAR), or other forms of multiple equations analysis. Structural equation models (SEM) combine elements of factor analysis and linear regressions, in one cohesive model. The main purpose of SEM in econometrics is the identification of systematic structures, in complex systems with many variables. The two main branches of SEM are Partial Least Squares (PLS) and LISREL. Henseler et al. (2009) suggest that PLS is a good compromise between theory-oriented covariance-based approaches such as LISREL, and the predictive power of Artificial Neural Nets. An extensive simulation study by Reinartz et al. (2009) found that PLS offers higher parameter estimation accuracy than LISREL, when the sample size is below 250–500, which is quite common in econometrics. Two studies by Marcoulides and Saunders (2006) and Reinartz et al. (2009) suggest that PLS offers much more reliable statistical tests than LISREL, particularly when the sample size is low.

Structural Equation Models (SEM) are based on the idea that a set of unobservable or complex latent variables are approximated, using multiple observed indicators, which reflect the latent variables, called the measurement models. The estimation of the parameters is performed using the Partial Least Squares (PLS) algorithm. In this small paper, all latent variables are considered to be reflective, meaning the indicators reflect and correlate with the latent variable. An extensive introduction to SEM and PLS methods can be found in Henseler et al. (2009).

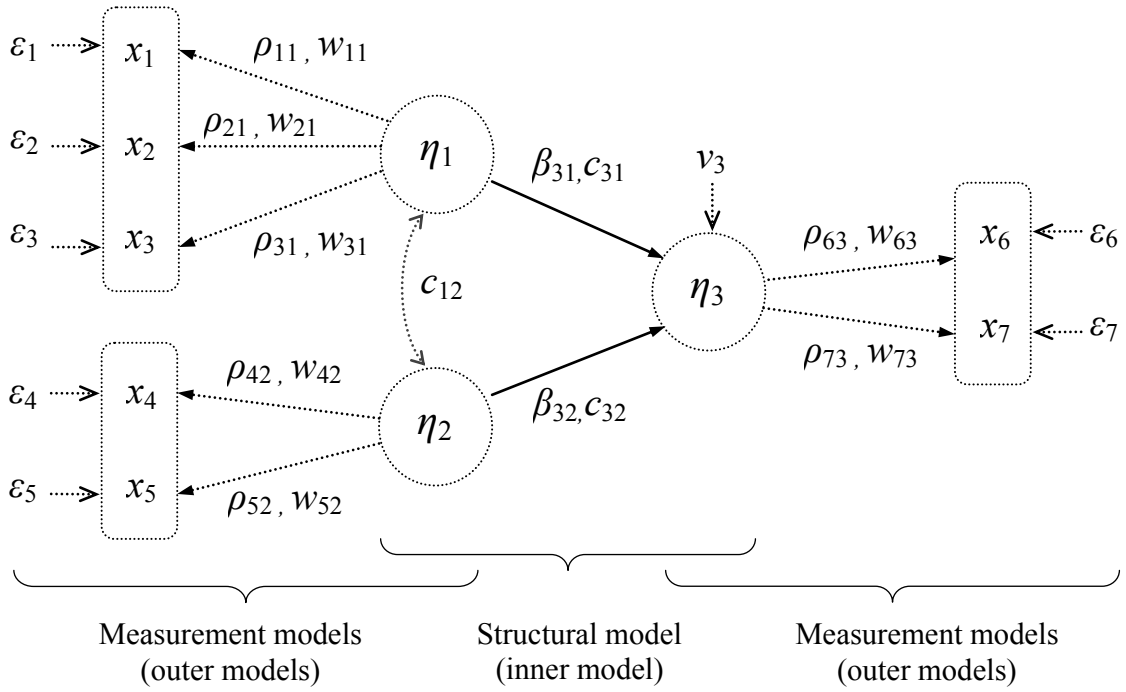

Figure 1. Structural Equation Model with latent variables (PLS path modeling)

Figure 1 illustrates a standard Structural Equation Model, with three latent variables η_1 to η_3, with their specific set of indicators x_1 to x_7. The inner structural model in Figure 1 can be written as the linear regressions in (1). The equation contains the relations of η_3 with η_1, and η_2 with the error v_3. No intercepts are required for standardized variables. The inner model may contain a high number of equations, but it is more common in econometrics to use a single equation inner model. The coefficients β_{ij} are estimated using Ordinary Least Squares, once the latent variable scores are calculated as part of the PLS algorithm.

$$\eta_3 = \beta_{31}\eta_1 + \beta_{32}\eta_2 + v_3 \tag{1}$$

The outer measurement models in Figure 1 can be written as the weight and loading relations in (2) and (3). The measurement models connect the latent variables with weights w_{ij} and loadings (correlations) ρ_{ij}. The weights are calculated using the PLS algorithm. This data-oriented approach allows the calculation of latent variable scores as linear combinations of their indicators (2), similar to principal component analysis.

$$\eta_1 = w_{11}x_1 + w_{21}x_2 + w_{31}x_3 \qquad \eta_3 = w_{63}x_6 + w_{73}x_7 \qquad \eta_2 = w_{42}x_4 + w_{52}x_5 \tag{2}$$

The loading relations (3) for Figure 1 define the relations of the indictors with their latent variables, as bivariate regressions with the error ε_i similar to factor analysis.

$$\begin{aligned} x_1 &= \rho_{11}\eta_1 + \varepsilon_1 & x_4 &= \rho_{42}\eta_2 + \varepsilon_4 & x_6 &= \rho_{63}\eta_3 + \varepsilon_6 \\ x_2 &= \rho_{21}\eta_1 + \varepsilon_2 & x_5 &= \rho_{52}\eta_2 + \varepsilon_5 & x_7 &= \rho_{73}\eta_3 + \varepsilon_7 \\ x_3 &= \rho_{31}\eta_1 + \varepsilon_3 \end{aligned} \tag{3}$$

There are several specific estimation procedures available. The PLS algorithm is used because of the above mentioned advantages with smaller sample sizes, and the inherent data-oriented tradition.

3 Data Set and Definitions

Finding reliable data sources for the shadow economy is not an easy task. The shadow economy, as a hidden factor, is difficult to measure, making it necessary to use multiple observable indicators to approximate its extent. The quantity, and particularly the quality, of these indicators are crucial for the overall performance and validity of the models. The revised data set used in this paper includes 58 indicators for 35 countries, including 28 OECD countries and south-eastern European transformation countries. The original data set was collected by Thießen (2010) for the Deutsches Institut für Wirtschaftsforschung DIW shadow economy project. The sources include the World Bank, United Nations, International Monetary Fund, World Values Survey, World Economic Forum, and others, making it presumably one of the largest data sets available for this topic. The latent variable *shadow economy* is approximated using the following four reflective indicators.

- The first indicator *shadow economy survey* is based on expert opinions of the World Economic Forum, and gives a direct estimation of the shadow economy.
- The established *Corruption Perception Index* by Transparency International is composed of 13 independent key figures, with the assumption that countries with more corruption have a larger shadow economy.
- The *cash holdings quota M0/M2* by the World Bank should also be correlated with the level of shadow economy, which is based on cash availability.
- A local *tax evasion survey* by the World Values Survey, is based on the question of whether tax evasion, in general, is justifiable as the fourth indicator.

A brief look at these four indicators suggests that the first three are positively correlated, and thus show generally plausible results, whereas the tax evasion survey seems to give more erratic results that are biased presumably by local effects. The following SEM should be able to filter those biases automatically, by giving the last indicator a smaller weight. These four indicators construct the latent variable shadow economy, which can be interpreted as an index of the extent of the actual shadow economy.

An important aspect that is often neglected is a proper definition and classification of the shadow economy. Similar concepts, such as informal activities, black markets, legal and illegal hidden activities, or underground economy, can overlap, or be synonymous, with the shadow economy. Related concepts are corruption, welfare fraud or tax evasion, and the lines between them are blurred. A first definition of the shadow economy could include all goods and services that are not declared for tax. This concept would include legal activities, such as personal household production; for example, cooking your own meal. A second definition can include the use of cash money. This would include illegal activities, such as the drug trade. The overall wealth of a nation can be divided into three major branches.

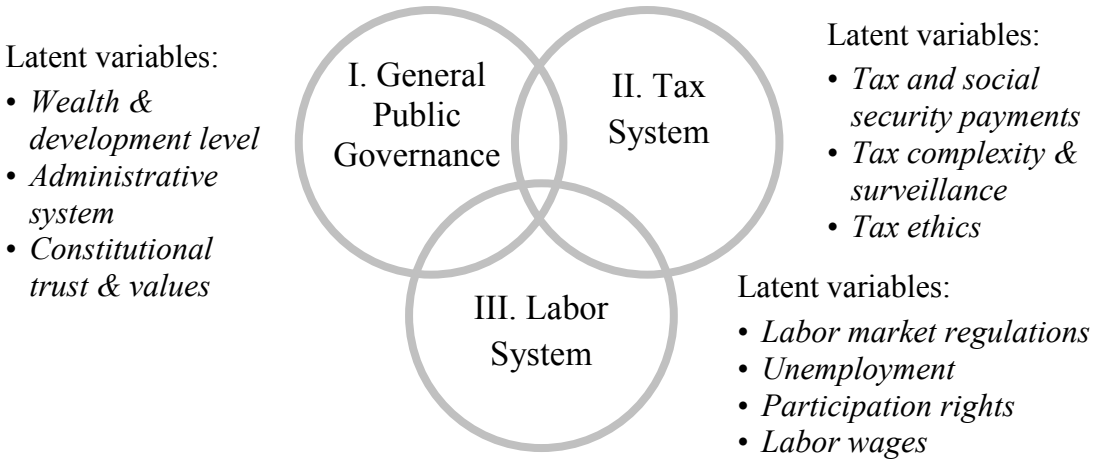

Figure 2. Determinants of the Shadow Economy

- The first and largest segment in any developed society should be the official and legal production and consumption of goods and services.
- The second segment includes activities that are unofficial and illegal, such as black markets, illegal employment, or drug production, which are commonly referred to as "shadow economy".
- The third segment includes unofficial but legal activities, such as personal household production, or limited neighborly help.

It is important to recognize that only the second segment should be the focus of political activities. Some definitions of shadow economy may include the third segment, and thus give an exaggerated analysis. There is no obvious reason why unofficial but legal activities should be fought. The distinction in the second group, between activities that could potentially become part of the official economy (untaxed black markets for common goods), and permanently illegal activities (such as the production of hard drugs), is important for political strategies. Unofficial production should become part of the official markets, whereas generic illegal activities will never become part of the official economy. Estimations of the shadow economy, that include both the second and third segments, would be highly exaggerated and misleading in that regard. Political strategists will probably focus on those high estimations, in the belief that all of it can be taxed and transferred into the official economy. This could, potentially, lead to political actions with the wrong focus.

Typically, the different statistical approaches to estimate shadow economies measure different concepts of the shadow economy. The currency-demand approach tries to isolate the amount of cash money that is used in the shadow economy. This should exclude most legal household production that does not use money (third segment), but would include all other illegal activities that are paid for in cash (second segment). Micro-surveys can try to give a more detailed insight into all segments, but they are potentially biased because of incorrect responses. Structural Equation Models (SEM) focus on latent relations between the shadow economy and economic or social variables, and do not offer direct percentages of GDP. SEM and currency approaches can be combined, with the intent to give more stable estimations.

Table 1. Determinants of *shadow economy* (depended variable)

Group	Latent variable	Coefficient	Correl.
I. General Public Governance	η_2 *Wealth & development level*	−0.60**	−0.89
	η_3 *Administrative system*	−0.69**	−0.92
	η_4 *Constitutional trust & values*	−0.07	−0.89
II. Tax System	η_5 *Tax and social security payments*	0.13*	−0.59
	η_6 *Tax complexity & surveillance*	−0.18**	0.82
	η_7 *Tax ethics*	−0.01	0.28
III. Labor System	η_8 *Labor market regulations*	0.13*	−0.57
	η_9 *Unemployment*	0.002	0.41
	η_{10} *Participation rights*	−0.06	−0.25
	η_{11} *Labor wages*	0.03	−0.37

All 10 standardized coefficients and bivariate correlations are estimated using the full model ($R^2 = 0.93$). The three subgroup models are used to calculate the group R^2. * 95%, ** 99% significance
Source: Own estimations in Ruge (2010).

4 Determinants of the Shadow Economy

In Figure 2, the determinants of the shadow economy can be arranged in three groups. Each group consists of multiple latent variables which are approximated with a set of specific indicators. The three groups are not independent, and the parameters are estimated in the following Structural Equation Model, using all 11 latent variables η_1 to η_{11}, with 58 indicators x_1 to x_{58}. All observed and latent variables are standardized with zero mean and variance of one.

- The first group, General Public Governance, is represented by three latent variables: *wealth and development level* (three indicators); *administrative system* (fourteen indicators); and *constitutional trust and values* (eleven indicators).
- The second group, Tax System, consists of three latent variables: *tax and social security payments* (seven indicators), *tax complexity and surveillance* (six indicators), and *tax ethics* (two indicators).
- The third group, Labor System, is represented by four latent variables: *labor market regulations* (four indicators), *unemployment* (one indicator), *participation rights* (three indicators), and *labor wages* (two indicators).

The model results in Table 1 show that the shadow economy is connected closely to its determinants, with an $R^2 = 0.93$ in the full model. The model estimates that a higher wealth and development level, a better administrative system, lower taxes and social security payments, higher tax complexity and surveillance, and the extent of labor market regulations reduce the level of the shadow economy. It is crucial to take a more detailed look at the indicators to understand the latent variables.

Figure 3 illustrates the influences in the first group Public Governance on the shadow economy. The latent variable *shadow economy* is constructed using its four indicators,

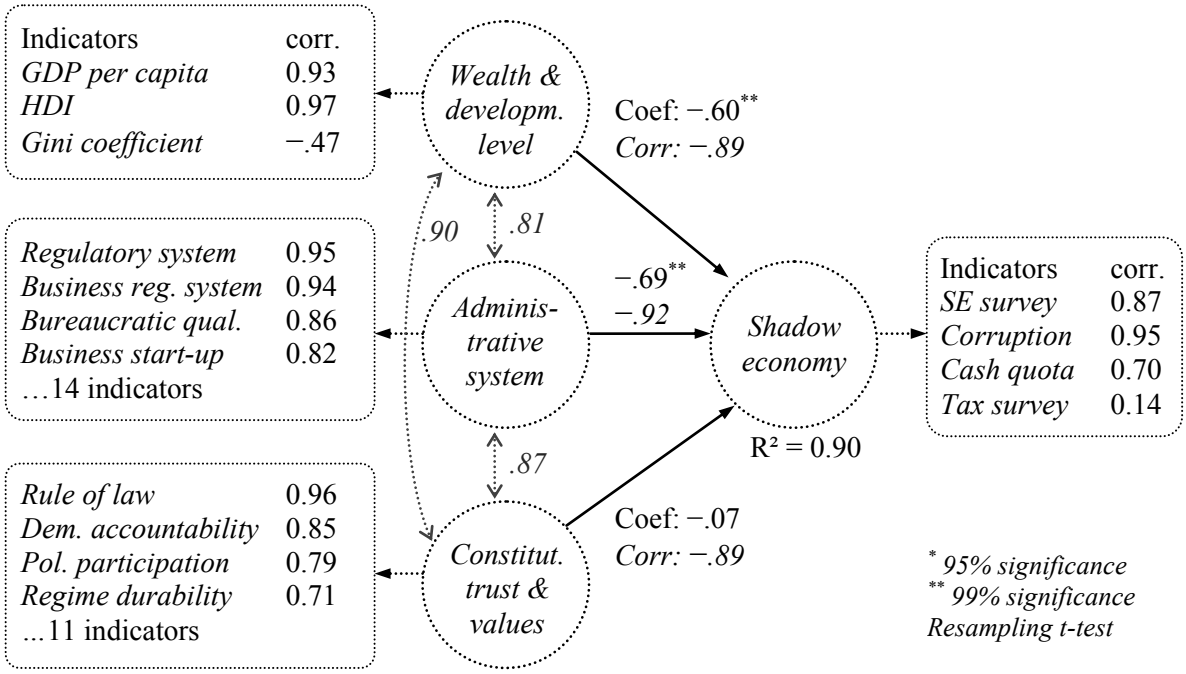

Figure 3. Public governance and shadow economy
Source: own estimations in Ruge (2010)

introduced above. The ladings and weights are estimated by the model itself with all 11 latent variables and 58 indicators.

The latent variable, *wealth and development level,* is constructed with three indicators, *Human Development Index, GDP per capita*, and *Gini coefficient*. The strong negative correlation of −.89 with the *shadow economy* indicates that raising the general wealth and development level of a country should be a focus of political actions. The latent variable, *administrative system,* is constructed with 14 indicators, which are based mainly on surveys concerning the quality of governance, regulations and bureaucratic procedures. The strong negative correlation of −0.92 with the *shadow economy* indicates that improving the administrative system of a country is the most important and effective way to decrease the shadow economy. The latent variable, *constitutional trust and values,* is based on 11 indicators, with surveys and indices concerning the trust in constitutional functions, such as the *rule of law* and *democratic accountability.* More estimates can be found in Ruge (2010).

5 The Importance of Public Governance

The previous analysis concluded that the most important influencing factors for the shadow economy are the quality of public governance, the general level of development, the quality of public administration, and constitutional trust and values. These "soft factors" are often neglected in standard economic theory, which, instead, focuses on tax cuts and fewer regulations. Good examples are northern European countries, which have high taxes combined with low levels of shadow economy. Eastern European countries tend to have lower taxes, but the quality of public governance is lower as well, and the

levels of shadow economy are higher. The best state is not necessarily the one with the lowest taxes, but the one with the best system of public governance.

More detailed results for individual countries can be found in Table 2 (new estimates). Two examples should clarify the relations. Italy is a relatively wealthy country (7.6 index score), but the perceived quality of the administrative system (4.4), and constitutional trust & values (6.5), are average, or below average, and cause unusual high levels of shadow economy. The renewal and improvement of public governance should be the focus of politics. The second example is New Zealand, which has the lowest levels of shadow economy in this analysis. New Zealand has a very well-perceived administrative system (8.8) and excellent constitutional trust & values (9.8), and thus benefits from these institutions.

6 Size of the Shadow Economy

How can the size of the shadow economy be estimated? The Structural Equation Models are based on indices. However, it is possible to rescale the shadow economy indices, based on results from external currency-demand models, to provide estimated shadow economy percentages of GDP. This idea is referred to as calibrating. The calibrating approach, in this paper, uses the average and standard deviation of the currency-demand results by Thießen (2010) and transfers them onto the shadow economy index.

The currency-demand approach relies on assumptions about the unobservable currency velocity within the shadow economy, which is difficult to measure with a wide range of potential results. Three scenarios can be used with specific assumptions about the velocity of money within the shadow economy. Scenario 1: the lowest velocity of M2 (includes money and close substitutes) is assumed. The estimations in Scenario 1 can be considered a lower limit. Scenario 2: a moderate velocity of M1 (includes demand deposits) is assumed. Scenario 2 can be considered a medium scenario. Scenario 3: the highest velocity as a mix of M1 and M0 (monetary base) is assumed. The estimations in Scenario 3 can be considered an upper limit.

As an example, the size of the shadow economy in Germany can be estimated between 2.2% and 14.4% of GDP depending on the specific model assumptions and definitions of the shadow economy. Italy ranges between 3.6% and 23.4% and Greece between 3.7% and 23.8% depending on the model scenario. More estimates can be found in Ruge (2010) and possibly in future research. The disparity of the results emphasizes the need for further research.

7 Conclusions

The results of this research show that the shadow economy is connected closely to its determinants. The focus of political activities should be the overall quality of public governance like administrative systems, because they have the strongest influence on the shadow economy. It is important to understand that the determinants are interdependent, e.g. lower taxes can reduce the quality of public services. Political measures need to be implemented carefully with respect to counter-effects within the bounds of reason.

Table 2. Shadow economy and public governance' ranking (indexes)

Nr.	Countries	Shadow economy	Wealth & development	Administrative system	Constitutional trust & values
1.	New Zealand	1.0	6.8	8,8	9,8
2.	Finland	1.3	8.4	10,0	8,8
3.	Denmark	1.5	8.9	8,8	9,1
4.	Australia	1.8	8.1	7,7	9,2
5.	United Kingdom	2.0	7.7	7,7	9,3
6.	Canada	2.0	8.5	8,4	8,8
7.	Switzerland	2.1	8.8	7,1	9,3
8.	Norway	2.1	10.0	7,7	10,0
9.	Netherlands	2.2	8.5	7,9	8,9
10.	Sweden	2.8	9.0	8,5	9,6
11.	Japan	2.9	7.7	5,8	7,7
12.	United States	3.0	8.2	8,1	8,8
13.	Ireland	3.0	8.3	8,0	9,1
14.	France	3.4	8.3	7,4	8,4
15.	Austria	3.4	8.8	6,1	7,0
16.	Germany	3.6	7.9	7,4	8,1
17.	Belgium	4.7	8.4	6,4	8,2
18.	Slovenia	4.8	6.8	4,9	6,5
19.	Spain	5.0	7.3	5,9	7,0
20.	Portugal	5.2	5.1	5,5	7,5
21.	Cyprus	5.3	6.7	5,9	6,7
22.	South Korea	5.4	6.1	4,2	4,0
23.	Estonia	5.8	3.9	7,5	4,4
24.	Slovak Rep	6.1	4.6	4,5	4,9
25.	Czech Rep	6.2	5.8	4,9	6,5
26.	Italy	6.9	7.6	4,4	6,5
27.	Hungary	7.0	4.8	4,0	6,9
28.	Greece	7.0	6.5	5,7	6,6
29.	Poland	7.6	3.8	2,9	4,9
30.	Lithuania	8.0	3.6	4,2	4,5
31.	Turkey	9.2	1.0	2,7	2,0
32.	Mexico	9.6	1.9	2,1	1,0
33.	Bulgaria	9.7	2.7	1,0	3,3
34.	Latvia	10.0	3.2	3,9	6,0
35.	Romania	10.0	2.5	1,2	2,6

The shadow economy and public governance indexes are based on the latent variable scores from the structural equation model, linearly rescaled to 1–10 (own estimations). Higher values represent a larger shadow economy and better governance (better administrative system, etc.).

References

Breusch, T. (2005) *Estimating the underground economy using MIMIC models*. Available at, 2011, http://129.3.20.41/eps/em/papers/0507/0507003.pdf

Breusch, T. (2006) *Australia's underground economy: redux?* Available at, 2011, http://mpra.ub.uni-muenchen.de/9980/

Henseler, J., Ringle, C. M., & Sinkovics, R. (2009) *The use of Partial Least Squares at modeling in international marketing. New Challenges to International Marketing, Advances in International Marketing*, Vol. 20, p. 277–319.

Macias, J.B. & Cazzavillan, G. (2008) *Modelling the Informal Economy in Mexico. A Structural Equation Approach*. Working Papers 2008–41, University of Venice, 'Ca'Foscari', Department of Economics.

Marcoulides, G.A., & Saunders, C. (2006) *PLS: a silver bullet?* In *Management Information Systems Quarterly*, 30(2), p. III–IX.

Reinartz, W.J., Haenlein, M., & Henseler, J. (2009) *An Empirical Comparison of the Efficacy of Covariance-Based and Variance-Based SEM*. *INSEAD Working Paper* No. 2009, 44, MKT. Available online, 2011: http://ssrn.com/abstract=1462666

Ruge, M. (2010) *Determinants and Size of the Shadow Economy – A Structural Equation Model*. *International Economic Journal*, 24, 4, pp. 511–523.

Schneider, F. (2004) *Shadow economies of 145 countries all over the world: estimation results over the period 1999 to 2003*. *IZA Discussion Papers* 1431, Bonn, Germany. Available at, 2011, ftp://repec.iza.org/RePEc/Discussionpaper/dp1431.pdf

Thießen, U. (2010) *The shadow economy in international comparison: Options for economic policy derived from an OECD panel analysis*. *International Economic Journal*, 24, 4, pp. 481–509.